REMARKS

Applicants acknowledge the indication of the allowability of the subject matter of Claims 2, 3, 5, 8, 11 and 13-14, as set forth at page 1 of the Office Action. In particular, the latter claims would be allowable if rewritten in independent form. However, for the reasons set forth hereinafter, Applicants respectfully submit that all of the latter claims are now allowable in their present dependent form.

Claims 1, 4, 6, 7, 9, 10 and 12 have been rejected under 35 U.S.C. §103(a) as unpatentable over Walsh (U.S. Patent No. 6,492,044) in view of Frank et al (U.S. Patent No. 6,436,563). However, for the reasons set forth hereinafter, Applicants respectfully submit that all claims of record in this application distinguish over the Walsh and Frank et al patents, whether considered separately or in combination.

The present invention is directed to a method and apparatus for recovering and recycling water contained in the exhaust air stream of a fuel cell system. The recovery and reuse of such water is important in that a continuous supply of water is essential for proper operation of certain fuel cell systems, and it is a substantial disadvantage if water contained in the fuel cell exhaust gases

is discharged to the atmosphere, such that it is necessary to provide a separate water support for operation of the fuel cell system.

The present invention addresses the need to recover and recycle water from the exhaust gases of a fuel cell system by providing a water absorbing material in the exhaust air stream, such that water contained in exhaust gases from the fuel cell is absorbed, and is subsequently released again by desorption. For the latter purpose, an absorption unit is provided in the exhaust gas stream so that water contained in the exhaust gas can be taken up by the absorbing agent of the absorption unit. A desorption unit, which contains the absorbing agent charged with water, is disposed in the intake air stream which flows to the fuel cell system, and removes water contained in the absorbing agent, transferring it to the intake air flow, so that the water is supplied to the fuel cell system once again. Thus, the water absorption/desorption system according to the invention allows virtually complete recovery of the water used in the process, without requiring an increase in system pressure.

As is seen in more detail in Figure 2, the water recovery system according to the invention is structured such that the water absorbing agent (glycol) circulates in a closed circuit between the absorber unit 15 and the desorber unit 16. In this manner, water is transferred from the cathode exhaust gases to the water absorbing agent in the absorber 15. The water absorbing agent then flows

through the line 20 into the desorber unit 16, where water contained therein is removed and transferred to the hot dry intake air which is thus humidified and provided to the fuel cell system.

The Walsh reference discloses a reactant conditioning system for high temperature fuel cells in which a desiccant, capable of sorbing water vapor is placed at one of a variety of locations throughout the system. For example, as noted at Column 4, lines 62-65, the desiccant may be disposed in the inlet and/or outlet lines of the cathode gas flow path and the anode gas flow path. The desiccant placed in the gas flow path in this manner absorbs water that condenses as the system 20 cools down after it is shut down. Thereafter, water sorbed in this manner is desorbed (and the desiccant regenerated) as the system heats back up during a subsequent start up operation. The purpose of this arrangement is to prevent water condensation which might otherwise form on the fuel cell membrane during cooling of the fuel cell when it is shutdown. (See, for example, Column 3, lines 50-58; Column 5, lines 41-45; Column 6, lines 21-31; and Column 7, lines 29-36.)

Claim 1 as amended defines a method of operating a fuel cell system in which water contained in the exhaust gas stream of the fuel cell system is removed by means of absorption by an absorbing agent and the water thus removed is released by desorption. Claim 1 further recites that the removal of

water and the release of the water "are both performed during an ongoing operation of the fuel cell system". The latter feature of the invention is neither taught nor suggested by Walsh. That is, as can be seen from the foregoing brief description, in Walsh, the purpose and operation of the desiccant, which is placed at a fixed location in the gas flow stream is simply to remove water by absorption during cooling of the system following a shutdown, and to release water during a subsequent warm-up of the unit. However, once the system has reached temperature, and the desiccant has been "regenerated", it contains no further water, and performs no function until the system is once again shutdown, when it absorbs water which might otherwise condense during the cooling down period, damaging the fuel cell membrane. Accordingly, the removal of water and the release of the water are not "both performed during an ongoing operation of the fuel cell system".

Claim 9 is limited in a manner similar to Claim 1, reciting that the absorption and desorption units are both "operable during an ongoing operation of said fuel cell system, for removing water contained in the exhaust gas stream, and returning it to said intake air stream". In addition, a new Claim 15 has been added, which defines a fuel system having a water absorption unit situated in an exhaust gas flow path and a water desorbing unit disposed in an intake air flow path, with means for migrating a water absorbent material between the water

absorption unit and the water desorbing unit. The latter features of the invention are also neither taught nor suggested by Walsh.

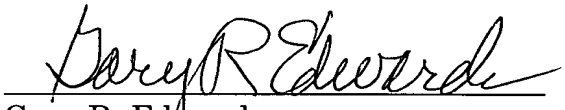
The Frank et al reference, on the other hand, has been cited as teaching that it is conventional to recycle excess water produced by the fuel cell, to avoid having to provide a separate water source. For this purpose, dryers are connected to the cathode inlet and cathode outlet, in order to enable one dryer to recover moisture from an exhausted oxidant stream while the other dryer is humidifying an incoming stream, as noted in the abstract. Frank et al, however, does not utilize a water absorbing/desorbing system, such as defined in independent Claims 1, 10 and 15, and fails to teach or suggest the elements which are missing in Walsh. In particular, nothing contained in Frank et al would suggest a modification of Walsh such that water absorption and desorption are performed on an ongoing basis during operation of the fuel cell system. Indeed, because the purpose of the Walsh method and apparatus is simply to prevent the formation of condensation on the fuel cell membrane, there would be no need for such modification, which would be incompatible with its overall function and purpose.

In light of the foregoing remarks, this application should be in condition for allowance, and early passage of this case to issue is respectfully requested. If there are any questions regarding this amendment or the application in general,

a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #225/50177).

Respectfully submitted,



Gary R. Edwards
Registration No. 31,824

CROWELL & MORING LLP
Intellectual Property Group
P.O. Box 14300
Washington, DC 20044-4300
Telephone No.: (202) 624-2500
Facsimile No.: (202) 628-8844
GRE:kms

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